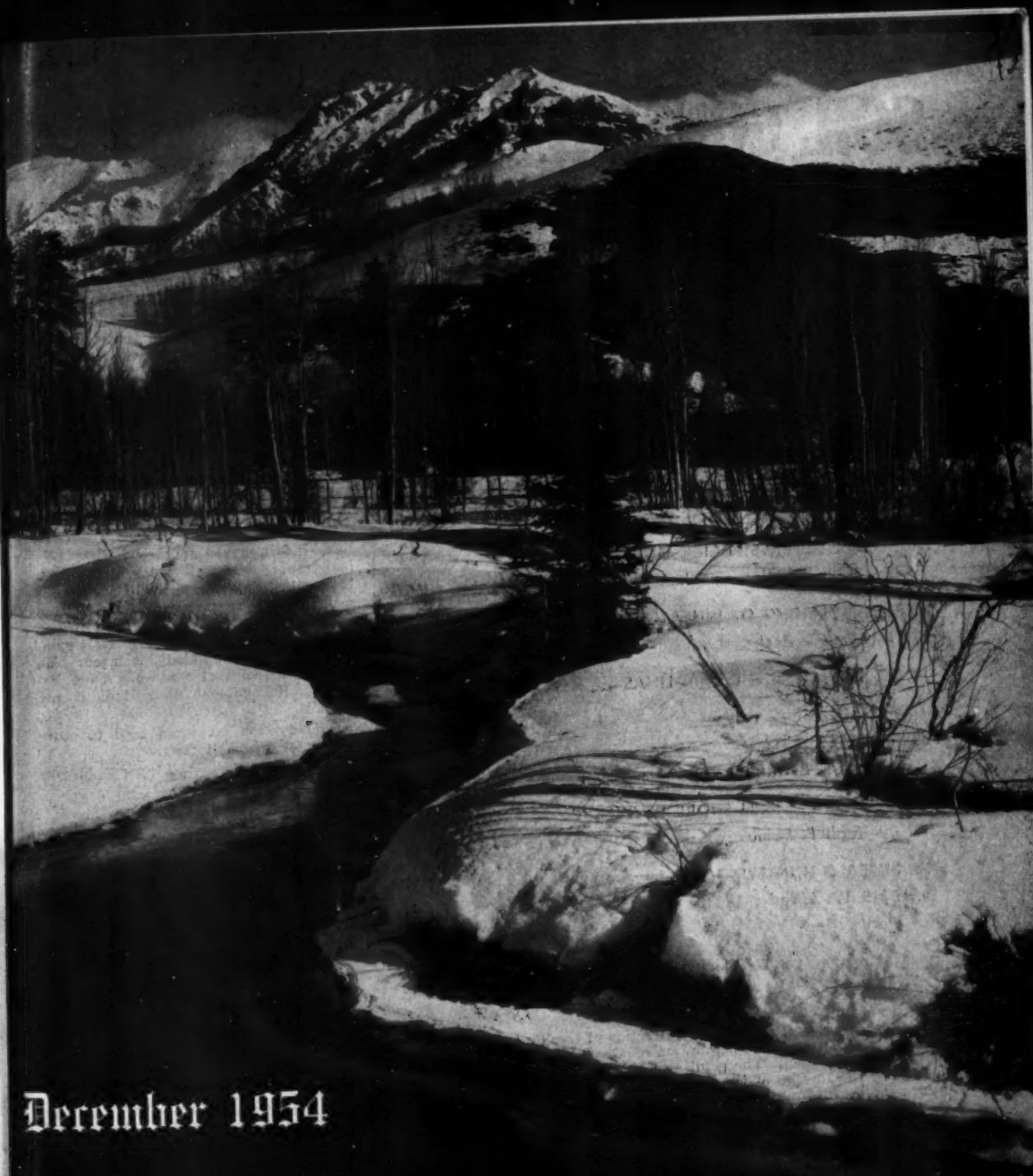

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SECRETARY OF AGRICULTURE

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ADMINISTRATOR, SOIL CONSERVATION SERVICE

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★ THIS MONTH ★

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WELLINGTON BRINK
Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 29, 1954. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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THE WELLS CAME BACK.—J. D. Glenn of the Tirzah section of Lancaster County, S. C., made an interesting observation on the effect of soil conservation measures and a nearby farm pond on his well.

In the past, Glenn's well often reached the point where it was necessary for him to curtail its use. This was before he installed an electric pump and increased the consumption of water. Now, his well is producing without fail in spite of the present drought and the increased use of well water on his farm.

Glenn feels that the conservation measures that have been established around his well, together with the nearby farm pond, have improved his ground water.

E. B. Haney is another farmer who had trouble with well water in the past. Haney drilled three wells to supply his needs. Two years ago Haney built a pond near his dairy barn to furnish water for washing the barn. Last summer one well supplied his need. He states, "I feel that my wells have improved 100 percent since I built my pond."

Conservation measures tend to store the water where it falls.

—JOHN E. NISBET

FRONT COVER.—Serene and beautiful is winter in Idaho. The snow-blanketed mountains not only please the painter, the photographer and the skiier but also hold the key to an abundant harvest on irrigated farms below. As the snow melts and flows down this stream, the man with the long-handled shovel waits hopefully; much snow and slow thawing improve his prospects. This picture was made 17 miles north of Ketchum.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

A Flood Comes to South Weber

Disaster leads to a working partnership of many agencies and individuals, and a system is installed that promises to protect farms against the perils of both flood and drought.

By THOMAS B. EVANS AND FRED RASMUSSEN

LATE in December of 1951, and well into 1952, snows came frequently and heavily in most of the mountainous areas of Utah. The watershed draining into the Weber River was no exception. Measurements on snow courses in the mountains showed snow depths and water content high above normal. To top it off, spring came very late and when it did there was water everywhere!

Note: The authors are, respectively, work unit conservationist and engineering specialist, Soil Conservation Service, Salt Lake Area No. 2, Utah.

Orville Bybee, president, South Weber Diversion and Canal Company.

The Weber River, normally a swift-running mountain stream, became a raging torrent. Cascading down into the valley below, it inundated farmlands, swept away bridges, cut deep into riverbanks, lowered the river bottom as much as 3 feet in places, and washed out diversion structures.

To the small community of South Weber, with its 58 farms located near the mouth of the canyon, the flood presented an ominous situation. There had been 6 separate diversions and 7 separate ditches that supplied irrigation water to 1,066 acres. The river washed out all of the diversion structures and some of the ditches. The river bottom was left lower in places than it had been before. In other places, the channel had changed, placing the river a considerable distance away from the points of diversion. Getting water to fields depending on irrigation became a major problem.

It was to help in such circumstances that Congress passed the Emergency Flood Rehabilitation Law in 1952. Under this law the farmers requested assistance from the Soil Conservation Service. When the technicians made their initial investigation, it was determined that it would be a questionable move to restore the individual diversions to their original condition because they would again be susceptible to destruction by floods. The construction of permanent dams for each diversion across the existing channel of the river, and the relocation of the river channel to bring it near the intakes, would be much too costly.

It was proposed that a site to be selected for a main permanent-type diversion dam across the Weber River, and that the seven ditches be consolidated into one main canal down to the points of distribution. This objective was easier to propose than to attain.

First of all, it must be determined whether or not the seven separate ditch companies would

wish to consolidate into one company for those portions of their systems which were involved. At this point, Orville Bybee, a farmer in South Weber, assumed leadership and called a meeting of the ditch companies concerned. He also invited to the meeting P. H. Sorensen, Weber River water commissioner; Pratt Whitesides, Production and Marketing Administration chairman, and technicians of the Soil Conservation Service. At one of the later meetings, the organization of the new South Weber Diversion and Canal Company was authorized. Judge J. A. Howell was given the task of looking after the legal aspects. Orville Bybee was elected president and Cecil Byram was made secretary.

The company furnished rodmen to assist SCS engineers on preliminary surveys and when the surveys were completed SCS engineers worked out an estimate of the preliminary cost. The estimate came to $30,000, of which the company's share would be $10,000, with the government paying the difference out of Flood Rehabilitation funds—an arrangement which was accepted by the stockholders. From then on the wheels really began to grind—sometimes slowly, sometimes rapidly as an obstacle was surmounted. The more the project developed, the more people, companies, State and Federal agencies became involved, until it was truly a cooperative affair. For example, the company applied to the Utah Water and Power Board for financial assistance amounting to $10,000, a loan which was granted. The Utah state engineer and the Weber River Water Commissioner, Philip Sorensen, were called into the picture on determination of water rights, maximum flow in each canal, total amount to be diverted out of the Weber River, and on permission to change and consolidate the points of diversion. The U. S. Army controlled some land through which the canal would go, and this called for negotiation of a right-of-way. Additional easements for rights-of-way had to be obtained from three private individuals and a gravel company. Finally, the canal crossed the Roy City waterline, a 6-inch and a 12-inch waterline to military installations, a main line which supplied natural gas to Weber and Davis counties, two large oil lines which furnished crude oil to Salt Lake refineries, a main highway, and a county road. Fortunately, only one of the pipelines had to be relocated to permit construction of the canal.

Between holding down a steady job, running his farm, negotiating easements, contacting the lawyer, the State engineer, and the Weber River water commissioner, arranging for rodmen and chainmen to help the engineers, and meeting with stockholders, Orville Bybee was a busy man!

Detailed engineering surveys were completed in the spring of 1953. The plans and specifications, as finally completed and approved by the company, called for the construction of one main diversion dam with 222 cubic yards of concrete, 8,600 feet of canal, 10 dividing structures and drops in main canal, 266 feet of 12-inch pipe for a siphon, and other miscellaneous items such as control gates, sluice gate and trash rack for dam, and culverts for road crossings.

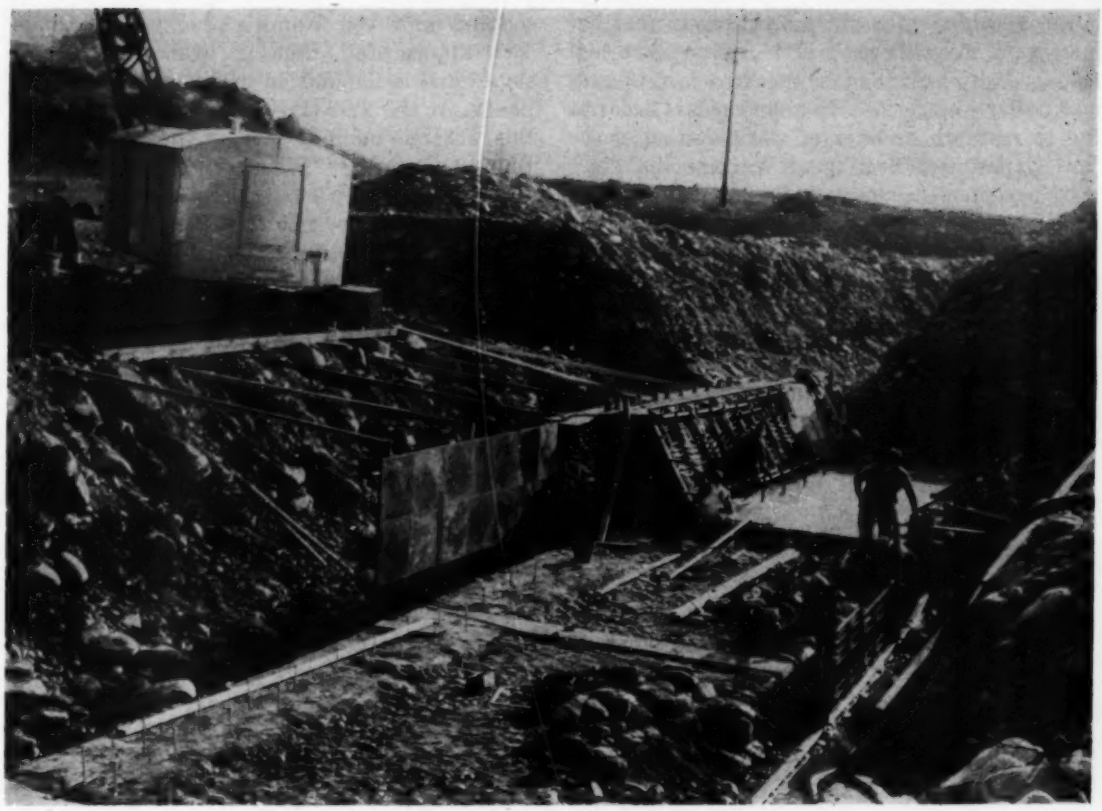
The job was advertised for bids and on September 8, 1953 the contract was awarded to the low bidder among nine firms offering to do the work. Construction began in September 1953.

Favored by a dry season and moderate weather conditions the project was completed in December of the same year. The only unfortunate accident occurred when a dragline boom came in contact with an overhead high-voltage transmission line which resulted in fatal burns to a foreman.

As is to be expected on projects of such magnitude, a few changes from the original designs were necessary as the job progressed. These, however, proved to be minor and the job was completed substantially as envisioned by the planners. Final cost ran slightly over $28,000 for actual construction, and about $4,200 for engineering and supervision.

After the system had been in use for awhile during the early summer of 1954, the stockholders were convinced they had a good thing. Last spring was exceptionally dry and there was very little snow left in the mountains. This combination made the water in Weber River very low for the irrigating season. Orville Bybee says that, if the new diversion and canal had not been installed, he does not see how many of the companies could have gotten any water for irrigation into their ditches this year.

Farmers of the South Weber area now have a modern, sound diversion dam and canal system, which assures them of complete protection and



Construction of diversion dam, South Weber Diversion Canal Company.

control of their irrigation water supply in times of flood as well as in times of drought. The project stands as a monument to the cooperation of farmers, ditch companies, and many Federal, State, and local government and private agencies.

Grass and Water Keep Farm Safe

Lakes and ponds, beef and sod, are a successful combination on this 500-acre watershed.

By M. B. BRISSIE

DAVE CAMERON is water-minded. He farms in the Delphia section of York County, S. C. He doesn't figure to lose many drops of water or very much topsoil from his 650 acres. With the recent completion of a 15-acre lake, on which he got help through the Catawba Soil Conservation District, Dave now has 10 ponds and lakes on a 500-acre watershed. Thus, he has stock water, fish, and irrigation water, and protection against rainfall shortages such as have been frequent the last few years. Some 35 acres of his land are under water.

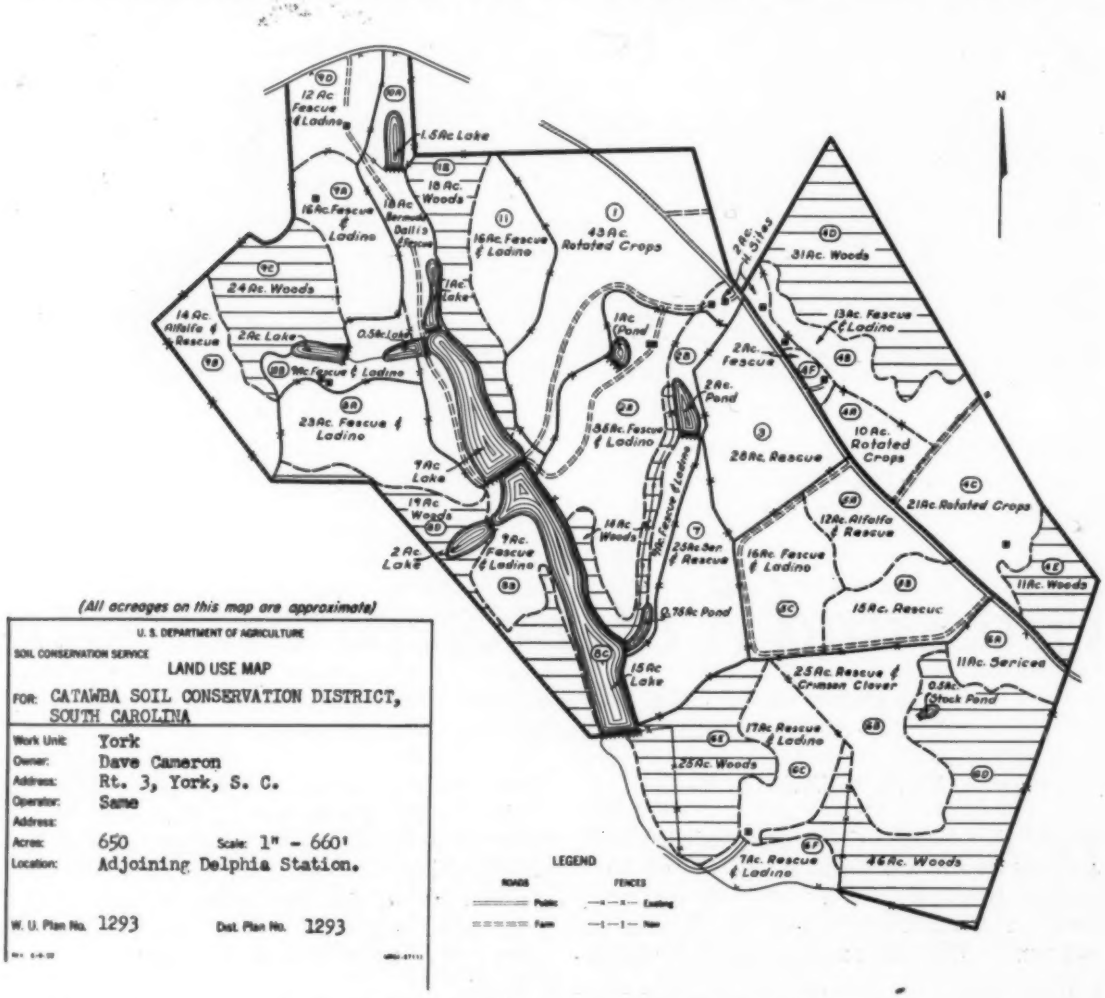
The drainage area feeding Dave Cameron's

Note.—The author is work unit conservationist, Soil Conservation Service, Rock Hill, N. C.

lakes is sodded with grass and clovers for the most part, allowing very little soil to leave his fields. Cultivated land in the area is terraced and under improved crop rotations. (According to research findings at the Soil Conservation Experiment Station at Watkinsville, Ga., good pasture sod is next to forest cover in preventing soil loss. Cultivated land (Class III) planted continuously in cotton lost 20 tons of soil per acre, but where a winter cover crop was used preceding cotton the loss was reduced to 9 tons per acre.)

Cameron really doesn't give the water that falls on his farm much chance to escape. If the sod and improved cropping practices fail to absorb the rainfall, then it "walks" down the slopes and is impounded in one of his series of ponds. At the first sign of drought in summer, this water is pumped back on the land to start the cycle again. "Whenever my fertilizer is washed into my ponds, I don't figure I lose it, as I will pump the water back on the land, and if I don't need to do that, then it will produce more fish," Cameron reasons.

Soil and water conservation is one of Cameron's pet concerns. He is one of the pioneer conservation farmers in York County, having been interested in the "doings" on the Fishing



Dave Cameron's guide to farming: his land use map.

Creek watershed in 1934-35, where the government then was furnishing technical assistance as well as labor and materials in getting large-scale conservation underway. Even though the Cameron farm was not in the Fishing Creek watershed, he invited technicians and engineers of the Soil Conservation Service to assist him in drawing up plans for work on his farm. He supplied all labor and materials, to get the job done.

During those years Cameron planted 125 to 150 acres of cotton on his farm and produced around ¾ to 1 bale per acre. By terracing and the use of soil-building rotations, he now produces, during an average year, from 1¼ to 1½ bales per acre. He attributes much of the increase to the use of annual lespedeza following small grain, and to its return to the soil. Cameron, during those early years, grew as high as 300 acres of annual lespedeza for seed.

Around 10 or 12 years ago Cameron began his two-armed system of farming—crops plus livestock. With the increase in numbers of beef cattle, he gradually shifted the use of his land from cultivated crops to hay and pasture crops. He now has 100 brood cows and is replacing all high grades with purebreds. Cameron believes that as fine cattle can be produced on grass in York County as can be grown in the grain country. Two things are necessary, he says, "First, you must have a good animal, and second, you must have grass with the proper elements in it, and this comes through putting the proper kinds and amounts of fertilizer on the grass." Cameron has his soil tested regularly with assistance from the county agent and his staff, and needed fertilizing elements are added scientifically.

"When you get the plants and fertilizer on the land, the only other things needed are water and sunshine," Cameron said. Here, again, he plays the game by his own rule book and does not use sprinkler irrigation but pumps water to his fields through open pipe and "floods" his fields. A 16-year-old boy is his irrigation personnel, moving the pipe to another portion of the field when the ground becomes soaked. For one section of his pasture he uses a small electric motor to pump water through underground mains. These mains are "tapped" at certain locations for irrigation of adjoining pasture areas. Cameron figures it costs him approximately $1.25 to $1.50 per day to operate his 5-horsepower electric pump. H. P. Lynn, of the Extension Service, assisted Cameron in working out his irrigation system.

Dave Cameron quietly goes about a job of soil and water conservation on the headwaters of a 500-acre watershed which will not only benefit him but also will help solve the problem of floods. District supervisors urge other landowners to follow the example of Dave Cameron in holding the water where it falls through applying sound soil and water conservation practices.

Tall Grass Defeats Prairie Dogs

By PHILIP F. ALLAN and BEN OSBORN

WHEN grass destroys prairie dogs, that's news! But that's just what happened on the Wichita Mountains Wildlife Refuge, Oklahoma. Good range grass crowded a prairie dog town out of existence.

Prairie dogs are not believed by mammalogists to be "native" to the tall grass country, often called True Prairie. That is, they invaded that kind of grassland from the Mixed Prairie or short grass country farther west. It seems likely that the peak of the spread of prairie dogs eastward occurred about 1880 following heavy grazing of the tall grass area. Indian grass, big bluestem, switchgrass, little bluestem, and the other plants were abundant there in the early days. But as they declined the shorter grasses and weeds came in. That was what the prairie dogs liked. They, like the other weeds, moved in on the mid and tall grass country.

Note.—The authors, both with the Soil Conservation Service, are, respectively, biologist for the northeast states, Ithaca, N. Y., and soil conservationist, Midland, Tex.

A perky prairie dog surveys the situation in his town.

In September 1946, we discovered that a prairie dog town near Grace Mountain in the Wichita Refuge had been abandoned during the summer. There was plenty of evidence to show that the dogs had not been gone long. Recent burrows and scratchings, pellets, and an area bare of vegetation showed that the town recently had been occupied. Then we noticed that the vegetation around the town gave the appearance of concentric rings. The plants in each ring appeared to be different. First, there were mat-like weeds around the bare area; next there were short grasses. Then came taller weeds and grasses. And finally there was an outer border of tall grasses—the kinds that originally covered the site. We counted seven of those rings, each of them 50 to 200 feet wide. In the rings of plants we found old abandoned prairie dog burrows. The farther away from the center, the older they seemed to be. Their relative age could be told by the kinds of plants that occurred on the mounds.

Plants follow a regular system in covering a bare area—such as a plowed field. First come

the short-lived annual weeds. These are followed by annual grasses and other annual weeds. Then those are replaced by perennial weeds and the longer-lived grasses. And finally—in grass country—come the deeper rooted and more permanent grasses. We found that system repeated on the prairie dog mounds as we went from the center of the town toward its edges.

We decided to make a careful study of the prairie dog town to see if we could find out what had become of its inhabitants. With the help of Ernest Greenwalt and Julian Howard—both of them Fish and Wildlife Service men—we were able to reconstruct the history of the town. We tackled it from two angles—the record of grazing of the area, and the study of the rings of plants.

The Grace Mountain prairie dog town had been in existence a long time. While other prairie dog towns on the Refuge were poisoned often, no poisoning had been done in this town since 1926. It was being preserved as an example of a natural prairie dog town because of its distance from the boundaries of the Refuge —and, hence, the unlikelihood of spread onto private lands around the Refuge.

What is now the Wichita Mountains Wildlife Refuge was, until 1935, a National Forest. Livestock were grazed upon it under permits. And much of it was considerably overgrazed. In 1946 more than 24,000 acres of the total 60,000 were still in poor to fair range condition. In 1937 all private grazing permits were terminated, and since that time the pasture in which the Grace Mountain dog town was found has been grazed only by bison, antelope, elk, and deer. The stocking rate is now about 40 acres per animal unit. The bison herd does not seem to use the site of that prairie dog town much, so it was only lightly grazed, except by the dogs, during the 9 year period that followed the removal of cattle. It is of interest to note, that, in spite of poisoning, the other dog towns on the Refuge have continued to spread while the unpoisoned Grace Mountain town dwindled.

When we started looking into what happened in the town itself we discovered that it once covered about 50 acres. At one end there remained a small community of about a dozen prairie dogs occupying about an acre, but the same rings of vegetation were to be seen there as at the abandoned part of the town a quarter mile away. Old burrows showed that the two centers had once been connected.

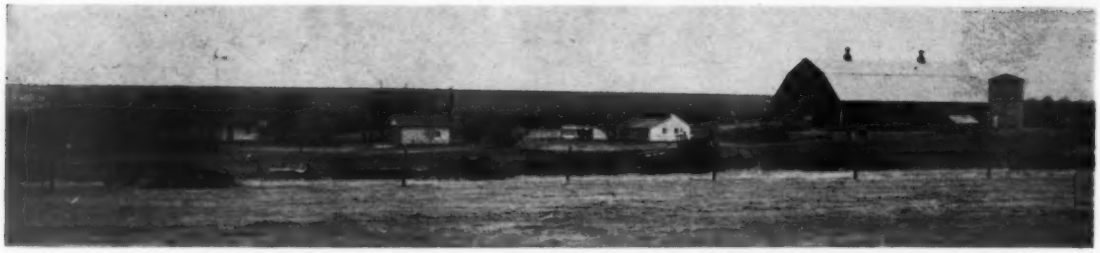
In the abandoned area we laid out two lines at right angles. One ran lengthwise and the other crosswise of the valley. This was done to see if differences in soils or moisture accounted for the rings of vegetation. Then we made records of the plants at 10 foot intervals, both by kind and abundance. We also noted prairie dog holes, ant beds, and any other things that might affect the vegetation.

Here is what we found. Each leg of the line showed the same belts of vegetation, so we agreed that it was not soil or moisture conditions that caused the rings. Where the prairie dogs had made their "last stand" 95 percent of the plants—which sparsely covered the denuded area—were short-lived, prostrate, annual weeds. The center was almost completely bare, but toward the edges more and more of those plants were found. Here we found claw marks, droppings, and signs of grazing by the prairie dogs. This area was 200 feet long and a hundred wide. Next came a 70- to 200-foot ring of prairie three-awn grass—an annual not much liked by prairie dogs nor by livestock. There were two distinct parts to this zone. First, we found plants of the year, and next, not only that year's growth but also dead plants of the previous year. Here the prairie dog mounds were covered with annual weeds.

The third belt had lots of prairie three-awn, but taller annual and perennial weeds were especially noticeable. The mounds here usually were covered with three-awn. Buffalograss, blue grama, poverty dropseed, tumble windmill grass—along with prairie three-awn—appeared in the next belt. And the mounds were covered with the same plants. Most of the mounds were indistinct here. Openings were filled in. It was obvious that the burrows hadn't been occupied for a few years.

Buffalograss and blue grama made up half of the cover of the next ring. Prairie three-awn was going out. The few old burrows of the prairie dogs were completely covered with plants typical of the rest of the belt. Ring num-

(Continued on page 113)



Fritton's barnyard stands in bold relief on the wind-swept horizon.

Stubble Mulching of Wheatland To Control Wind Erosion

By VIRGIL S. BECK

STUBBLE mulching of wheatland in wind erosion areas can provide the best assurance of producing a profitable crop and prevent soil blowing at the same time, according to Arthur Fritton, who owns and operates a 3,550-acre farm 11 miles northeast of Cheyenne Wells, Colo.

Stubble mulch tillage leaves practically all of the residues from the previous crop on the surface. These crop stubbles furnish protection against wind erosion, although the surface is broken enough to increase moisture penetration. The stubble also breaks up the raindrops and prevents crusting of the surface which results in a loss of water by runoff.

Fritton, who started stubble mulching last year, now has as fine a stand of wheat as can be found in Cheyenne County. If more rain comes within the next few weeks from my writing of this article, and there is no hail or insect damage, he expects to harvest between 15 to 20 bushels to the acre. While Fritton's wheat prospect is excellent, many other fields in this critical wind erosion area have been blown out and the crop has been lost. Although there have been several severe dust storms this year, soil blowing on Fritton's farm has been confined to a few small spots.

Dust storms are nothing new to Fritton. He was brought to this area as a small child in 1918 when his parents moved here from Nebraska. He has owned and operated the farm since 1929, and has a vivid recollection of the Dust Bowl of the Thirties.

"We have much more efficient machinery for farming now than we had a decade ago, and we also know a lot more about the techniques for controlling wind erosion," Fritton points out.

"However," he says, "a lot of the oldtime farmers in this part of the country have become careless during the wet years and are not following soil and water practices as they

Fritton (left) and Don Gillespie, SCS technician, appraise the wheat condition.

Closeup of residue from last year's wheat crop which still shows between the rows.

should. Too, a lot of farmers who have moved into this area since the old Dust Bowl days are not experienced in wind erosion control and don't know what to do. I don't believe soil blowing will be solved until farmers follow proper conservation methods. There should be someone living on each two or three sections of land so they can take immediate action if blowing starts."

Fritton has been cooperating with the Cheyenne County Soil Conservation District since it was organized. He is carrying out a complete soil and water conservation program on his land, and has received technical assistance from the Soil Conservation Service.

Of his 3,550 acres, 2,200 are in cultivation and 1,350 acres are in range. He keeps around a thousand acres in wheat, while another thousand acres are being fallowed. He grows feed crops on about 100 acres.

Fritton did his first stubble mulching last summer, using two 16-foot machines hooked together so he could plow a 32-foot strip at one time. The wheat was drilled in rows 14 inches apart and a good stand was obtained. Snows which fell in November and December melted in February. There was no moisture then until early May.

Despite four consecutive dry years, Fritton hasn't failed to make a crop because of them. He failed to harvest a wheat crop in 1951 because of winter kill and damage from bugs. Last year, he expected to harvest 20 bushels to the acre, but a hail storm caused heavy damage and only an average of 8 bushels to the acre was produced.

Fritton has a herd of 85 Hereford cows and calves. He grazes his cattle moderately on the wheat and produces his own row crop feed. All of the rangeland was contour furrowed in 1936 and 1937 during the days of the SCS erosion control demonstration project. Although grass is short because of the drought, moisture has been held in the contour furrows and has improved the growth.

In addition to his program of stubble mulching, Fritton has terraced 230 acres of his cropland and he farms on the contour to conserve moisture. He carries on a good grass-management program on his range, and has established windbreaks around the farmstead to provide protection from the winds and blowing soil.

HUDOBA HONORED.—The National Association of Conservation Education and Publicity has awarded Michael Hudoba, Washington editor of *Sports Afield*, its national award for conservation writing.

A beautifully engraved black and gold certificate of honor was presented to Mr. Hudoba in Washington, D. C., by J. J. Shomon of the Virginia Game Commission, representing NACEP as former board member and member of the awards committee.

Mike Hudoba, besides being active as a journalist and conservation director of the Outdoor Writers' Association, is generally recognized as one of the outstanding advocates of resource conservation in North America.

"Finer Farms" in the Carolinas

By JACK RILEY

This contest, sponsored by a power company, is helping to put more conservation on the land in two states.

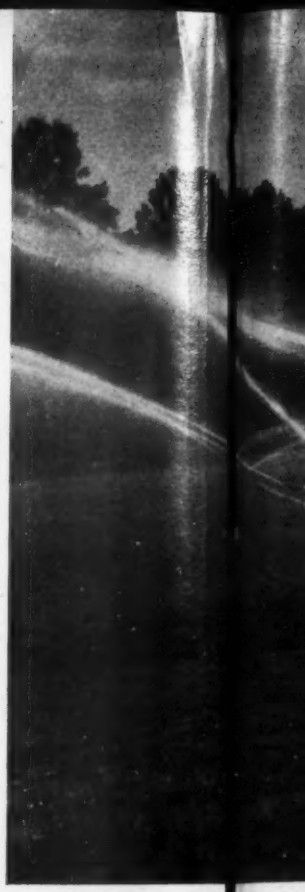
DISTRICT soil conservation supervisors and representatives of Carolina Power & Light Company have joined hands in a project that is giving greater impetus to soil and water conservation in the Carolinas.

This is the "Finer Farms" phase of the contest sponsored by the power company with the expressed objective of "helping to build a Finer Carolina." While organized communities vie for prizes in one classification, individual farmers are competing in another which is intended to build a finer Carolina by building finer farms.

In its second year, this contest now has enrolled 1,589 competing farms with a total of 670,422 acres, an increase over the participation in the initial contest.

(Continued on page 110)

R. E. Creech (left) and work unit conservationist C. W. Warrick stroll between strip of cotton and strip of grain on the Floyd C. Price farm near Pine Level, N. C. Slopes that once washed badly are now controlled by stripcropping and contour plowing.



Interested neigh gather soil-s

Lorentz T. White, Sr., st pump near Raleigh from pictur e pond birds suc the sw

neighb gather on the Joe Tippett farm near Zebulon to see a demonstration of supplemental irrigation, and to view such soil-saving practices as meadow stripping, contour plowing, terracing, and stripcropping.

Sr., st pump which irrigates his pasture lands pictur e pond which he has stocked with exotic ls suc the swans at lower left.

There once was a shoulder-deep ditch where Harold Peedin (left) and C. W. Warrick walk. Peedin tile-drained his entire farm, until now there isn't an open ditch on all 60 acres. He reclaimed many acres of unproductive, sour swampland.

Soil conservation districts and representatives of the Soil Conservation Service, from state level to local work unit conservationist, are cooperating in the contest in 48 North Carolina counties and 12 South Carolina counties which are eligible to enter. Soil conservation specialists are serving as judges of the individual farmer competitors. Tenants as well as landowners are eligible.

Individual prizes of $300, $200 and $100 will be awarded winners in each of three groups: farms of less than 100 acres, 100-400 acres and over 400 acres. Three county prizes of $250, $150 and $100 each will be awarded in two classifications: most acres entered and greatest percentage of the county's farms entered.

A recent tabulation of entries showed 1,021 North Carolina farms with 259,718 acres had entered and that 568 South Carolina farms totaling 410,704 acres are competing. There are 541 small farms in the competition, 678 middle-sized farms and 330 large farms competing, with 40 unclassified.

The winners will be announced early in 1955.

On the advice of their work unit conservationists, Carolina farmers are instituting a variety of practices prescribed specifically to make the most of their own acres. Strip farming, waterways, terracing, contour farming, farm ponds, wildlife borders, reforestation, drainage and pasturage are among the many practices instituted on farms in the contest.

Note.—The author is director, publicity department, Carolina Power and Light Company, Raleigh, N. C.

Technician George Winchester and Joe Tippett discuss the practices that have increased Tippett's tobacco and pasture yields manyfold. Among them is supplemental irrigation.

Fall affords J. D. Tippett time to disk and reseed the meadow strip which carries the runoff water along the ground between row crops. Such soil-saving practices are part of this young farmer's program as a contestant in the "Finer Carolina" competition.

Whether soil suffers erosion from rapid runoff on hillsides or the opposite evil of poor drainage in flatlands, there is a plan available to fit any farm. That fact was graphically demonstrated by two Johnston County neighbors who are "Finer Carolina" contestants.

One, Harold Peedin, faced the problem of draining flat, sour land. Not far away, Floyd C. Price, Jr., wanted to anchor hilly soil severely damaged by rapid runoff. Both men found a conservation plan that worked.

Peedin laid tile drains and closed every open ditch on his farm. He reclaimed acres previously non-productive, and even his lowest land now produces pasture for beef cattle. He practices water conservation by draining his land into a farm pond which waters his cattle, produces food fish and affords fire protection. He plans an irrigation system to pump the water back to the same fields during dry periods. The only washoff goes into the pond, where it supports fish.

"Peedin offers a fine example of conservation practices properly adapted to flat, coastal plains land," comments E. C. Jernigan of Raleigh, soil conservationist for a nine-county area. "He has converted poorly-drained land into high-capacity land."

Not far away, the Price farm solved the opposite problem by contour plowing and strip-

(Continued on page 120)

How Thirsty Is It?

By ROY E. BALLARD

"HOW Thirsty Is It?" was a question asked at a meeting of the Board of Directors of the Tehachapi (Calif.) Soil Conservation District. It referred to the soil and its capacity for absorbing additional water that might be made available. Other questions ran: Is there runoff water now being lost which could be conserved by spreading to recharge the underground supply? Are there suitable sites for such spreading?

The board was concerned by the underground water situation resulting from a period of several dry years, and by the reports from various local ranchers of the necessity of lowering pump bowls and of the reduced production of certain wells.

Operations on site C-1456-8. Bliss drives infiltrometer into ground; Johnson puts hose in place.

Note.—The author is work unit conservationist, Soil Conservation Service, Tehachapi, Calif.

Transfer of water from tank to drum on site C-1456-10.

When men of the caliber of these directors—J. C. Jacobsen, Jr., Don I. Carroll, Milo Sprinkle, Walter Eisenman and Pete Vukich—are faced with a problem of such gravity, you can expect some sort of action toward a solution. A special investigation seemed in order. Accordingly, a request for assistance was presented to the Agricultural Research Service.

Leonard Schiff, hydraulic engineer and project leader at Bakersfield, Calif., was put in charge of the study, with Eldred S. Bliss and Curtis E. Johnson supporting him. He designed a course of action involving three principal steps.

First, the topography was carefully charted. This was done by use of topographic sheets and from observations during on-the-spot field tours.

Second, soils were investigated, with a determination of the location of various soil types. This was designed to fix the sites most favorable for water penetration. Capability maps, prepared by soil scientists of the Soil Conservation Service, proved valuable.

Third, other relevant data such as rainfall records and verbal information supplied by

Tehachapi residents, were scrutinized. It was revealed that considerable winter flow, particularly, in wet years, either left the valley, evaporated, or entered the soil at less desirable locations.

From all this, it was seen desirable to collect infiltration data from a few key points, by means of ring infiltrometers, with the idea of finding out exactly how thirsty the soil was. Five advantageous places were selected and infiltrometers established.

At one site (C-1456-8) Bliss drove an infiltrometer into the ground while Johnson placed water hoses into the drums which served as a reservoir to provide a source of water supply. At a second location (C-1456-9) Schiff relieved Bliss and pounded the infiltrometer into the earth. When the equipment was completely installed (C-1456-10) he made a final check to see that the infiltrometer, at that site, was properly established and ready for operation. A few minutes later, data recordings began.

The setup was simple. Briefly, here is what it was and how it operated. The ring infiltrometer was a metal tube, 9 inches in diameter in this case, driven into the soil to a depth of approximately 18 inches. Two 50-gallon oil drums were adapted to serve as the reservoir supplying the water. A float valve was inserted inside the infiltrometer to regulate the water level inside the tube. One-quarter inch rubber tubing, joined together by a glass Y-tube and connected to the drums and to the float valve, completed the setup.

Work at second location, C-1456-9, as described in this article.

Closeup of equipment at work on site C-1609-8.

The apparatus was easily operated. The drums were filled with water. To accomplish that task, a 150-gallon tank was placed on a pickup in one instance (C-1456-10). In another, a 300-gallon tank was assembled on a 2-ton truck (C-1609-8). In each case, it was merely a matter of driving to a well, filling the tank, and transporting it to the infiltrometer location. There, transferring the water, through a tube or a hose, into the oil drums by gravity.

When the drums were filled and all adjustments properly made, the time was recorded on a data sheet and the operation was begun. Before all of the water had drained from the drums, a measurement was made from a predetermined reference point to the surface of the water inside the drums. That distance and the time were recorded onto the data sheet. The drums then were refilled, the time recorded, and the process repeated.

By collecting the data for a number of hours, varying with the soil type, the penetration rate was found for a given spot. By conducting comparable operations at a number of sites, the penetration rates of different soil types were found and compared. In other words, the question, "How Thirsty Is It?," was answered. On completion of the project, it was concluded that water spreading was feasible in certain areas of the Tehachapi Valley.

Even now, plans are being made to establish one water spreading setup, to collect the excess runoff of next winter's rains. Future plans will be based on the knowledge gained from actual field operation.

TALL GRASS DEFEATS PRAIRIE DOGS

(Continued from page 105)

ber 6 included a large percentage of silver bluestem and side-oats grama. The few prairie dog mounds we found were covered with the same plants.

Finally we came to the belt at the edges of the valley next to the wooded hillsides. There was no evidence of prairie dog activity, and the plants were typical of virgin prairie. In this zone big bluestem and switchgrass showed up markedly. Little bluestem and Indian grass were present.

With the historical and plant information at hand we were able to reconstruct the story of the prairie dog colony. We knew, from studies that others have made, that the various zones of plants represented typical stages of the invasion of bare areas by plants in the tall grass prairie. We were sure that prairie dogs did not originally occur there, but had come in at some time after the range had declined through heavy grazing by livestock. We found that other dog towns where bison grazed intensively were spreading in spite of control measures. In other words, the prairie dogs were closely associated with heavy grazing by larger animals.

Following the removal of cattle, the taller weeds and grasses began to move in on the Grace Mountain prairie dog town. In spite of the prairie dogs, which do not like tall vegetation, these plants began to cover the land. That crowded the prairie dogs into a smaller area. But the vegetation continued to close in. Perhaps some of the prairie dogs moved out as their town became crowded. There's some evidence that new dogs appeared in a town near Bakers Peak—a mile away—perhaps from the Grace Mountain town.

At last the colony became so concentrated that the prairie dogs completely destroyed their food supply. Only the unpalatable three-awn remained in a band which hemmed them in. That finished them.

On the basis of our study of the abandoned center of the Grace Mountain prairie dog town we thought it likely that the few dogs remaining a quarter mile away soon would go, too. "I had occasion to visit the town again on August 16," Ernest Greenwalt wrote us in 1947, "and there was no sign of any live dogs about. Our sacred town is depopulated." On April 30, 1948, Allan looked over the dog town. The last burrows to be vacated were becoming covered with vegetation. In the study area grass was now covering the once bare ground. The grass had destroyed the prairie dogs. (The scientific side of this story is contained in an article published in the July 1949 issue of *Ecology*.)

Maryland's Eastern Shore Revives

Farmers of six counties dig themselves out of the mud, and thus make possible a comprehensive program of soil and water conservation.

Drainage and clearing help Eastern Shore poultry farmers to develop their industry by providing excellent ranges. This farm is in Dorchester County.

By HUGH F. EAMES

WHEN a small group of farmers around Willards, in Maryland's Eastern Shore, couldn't agree on a plan to revitalize a group drainage system that had become useless after 50 years without maintenance, Joel Rayne, a general and poultry farmer, made this declaration of independence:

"I've been farming around here since 1938 and I'm tired of living in a mudhole! If we can't agree on group action, I think I can find a new outlet. If the Wicomico Soil Conservation District will help me, I'll dig the ditch and pay for it, and also pay for a better drainage system at my farm."

Technicians of the Soil Conservation Service, who work with the district, found a way. Eighteen old ditches were closed, a new 1½-mile main outlet ditch and 6 new lateral ditches, each about 2,200 feet long, were dug. The whole system cost Rayne about $6,500 and benefited all but 10 of his 130 acres.

Before this happening, Rayne had 28 fields of varying sizes and shapes. Use of equipment was limited and slow. There was much turning, the wear on machines was heavy, and costs were excessive. Since drainage was installed, he has reorganized his cropland into five 12- to 15-acre

rectangular fields where he does almost all the work with labor-saving equipment. He's free of "short rows."

Before drainage, Rayne's land was always wet. Almost every year in some fields he lost at least half of his production. In 10 years one field had yielded only 2 crops. In 1953 on land where plowing had taken 15 hours, he could do it in 5½ hours.

Rayne's production per acre has increased at least one-third. Costs in fitting land and planting, producing and harvesting crops have been reduced one-half. In 1953 he had excellent yields of soybeans and corn and he marketed 54,000 broilers. His enhanced income has permitted him to make improvements, and to turn it into a highly productive enterprise. Now he has means to buy, and time to work 68 more acres—a second farm—and also to operate his father's 224 acres.

Other Wicomico farmers have taken notice of Rayne's experience. That's why drainage systems at 26 different farms in the Willards area have been redone. It's why more and more group drainage jobs are being undertaken.

Drainage work done by district cooperators runs to about 2,900 miles. If it could be stretched out in a straight line, it would reach from Salisbury, Shore metropolis, to a point in the Pacific 460 miles beyond Portland, Oreg. This straight line would include: 57.78 miles of diversion ditches, 73.80 miles of terraces, 729.00 miles of outlets-farm water courses, 25.89 miles of tile ditches, 2,011.11 miles of open ditches.

These drainage facilities are spread over 7 out of 8 counties. Talbot is the only county in Maryland that doesn't have a soil conservation district. More than 85,000 acres have been benefited by the 2,037 miles of open and closed ditches. In addition, water management and conservation and good land use have been forwarded by establishment of 1,273 acres of contour furrows and construction of 234 farm ponds. Progress has been made in such related projects as shore- and streambank-erosion control and stream-channel improvements.

About 40 percent of Shore farmland needs drainage. Through long years this condition has shackled farmers in 6 lower counties. To a much lesser degree, it has plagued farmers in some parts of Kent. In Cecil, northernmost county, excess water generally is a comparatively minor conservation problem.

In the 6 lower counties, at varying degrees, drainage is the problem that almost every farmer has to solve before he can get many other benefits from his soil conservation district program.

Because soil conservation districts represent the most effective means of attacking their drainage problems, Shore farmers in the 6 lower counties have launched 83 group programs organized under state tax ditch laws. These call for 312 miles of ditches to benefit 149,000 acres in 1,528 farms. District cooperators already have completed 58 of these projects in which 258 miles of ditches benefit 71,208 acres in 951 farms. The cost has run almost $600,000.

These projects do not constitute all Shore drainage activities, because group ditching was done long before the districts arrived. Old records show 229 such projects involving more than 1,000 miles of ditches for the benefit of 416,000 acres in 5,214 farms. Some are only intentions,

At the left you see what happened in the Green Branch main ditch, flowing into the Pocomoke River, when it was not maintained. It grew up to duck, flag and smartweed, and cattails, and could not move excess water. After being cleaned out and put back to work as at the right, it can move excess water from 6,000 acres.

have never been planned for construction. For others, the planning is done, but digging has not been started, or is only partly done. Among completed jobs, some give service, but others have become ineffective, sometimes totally, because maintenance was overlooked. Now, in the soil conservation district system, serious attention is given this factor.

Accomplishments of district cooperators in applying other conservation and good land use practices are not as striking as those in Maryland districts that do not have such intense drainage troubles. The 4,100 Shore cooperators on January 1, 1954, in an average of 8 years of operation, have, however, built up such impressive totals as the following: 63,891 acres of cover cropping, 140,621 acres of crop rotations, 15,992 acres of mulching, 32,080 acres of contour farming, 5,477 acres of clearing, 10,394 acres of stripcropping.

Results from these general practices were apparent in the 67 million dollars cash income that farmers in the 8 counties received from their 1950 marketings of all farm products. Five years earlier the figure reached only 55 million dollars.

Participation in the national grassland program, under the districts, is found in such accomplishments as 28,078 acres of pasture improvement, 6,303 acres of pasture seeding, 6,909 acres of permanent hay.

These three practices, and some in the general list, are particularly important to dairy farmers. With production of more and better hay, pasture and grass silage, and harvesting of more grain, and more corn for silage and grain, they increase the size of their dairy herds, market more and better milk, and buy less feed. The Census shows that the 8 eastern shore counties in 1950 marketed 27,583,338 more pounds of whole milk than 5 years earlier.

Conservation farming also reaches into farm woodlots. District operators in 8 counties have put 84,334 acres of woods under district protective and improvement programs, including selective cutting. They have reforested 1,461 acres that will not produce any crop except trees.

In the 8 counties nearly half of the farms, more than half of the acreage in farms, and almost three-fourths of the full-time farmers are in soil conservation districts.

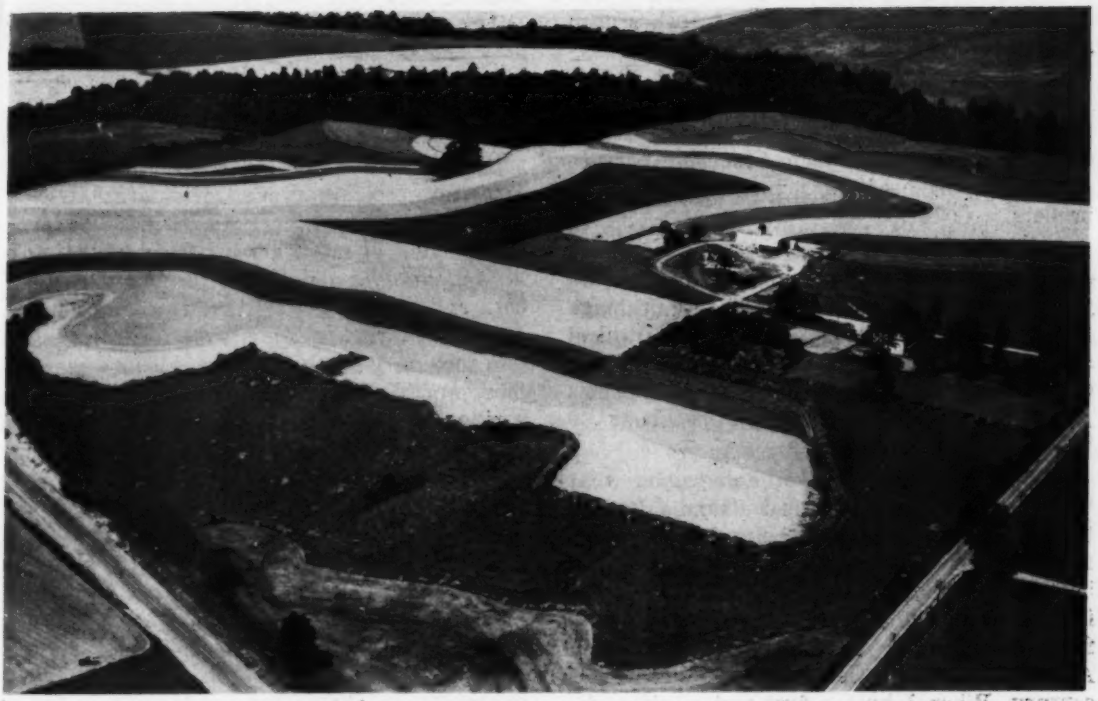
Throughout the Shore, the influence of soil conservation districts and conservation farming touches almost every phase of human activity. In Caroline, for example, businessmen, educators, clubwomen, veterans, manufacturers, bankers, professional men and clergymen, as well as almost all farmers, are among the most enthusiastic supporters of the soil conservation district.

The Rev. Wilson Davis, modern Methodist circuit rider who serves congregations in Ridgely, Bridgetown and Thawley in Tuckahoe Neck, preaches soil and water conservation, good land use, and district cooperation from his pulpit throughout the year, not only on "Conservation Sunday."

Willie S. Carroll, Ridgely farmer since 1928, has two farms under plans with the Caroline Soil Conservation District. He has had a 75 percent increase in production. "A lot of Caroline county farms would have been abandoned if our district hadn't been started," he declares, in emphasizing that so far as he knows "there isn't an abandoned farm in the county." He remembers when farmers were warned not to buy certain farms because they were so unproductive. Now, under the district program, these same farms are top notch producers.

County commissioners have special interest in what districts do to promote better handling of farmland. They have seen thousands of acres more of cropland appear since the soil conservation districts were organized. The addition of this land for productive purposes has meant raised valuations and a broadening of the tax base. It benefits every taxpayer. The commissioners also appreciate the fact that improved farm drainage has brought better roads and cut the cost of their upkeep. This, too, helps every taxpayer.

John E. Rolley knows the help that a district can be when you have as little as 5 acres of cropland. He bought a 179-acre farm in Somerset County, in cooperation with the Farmers Home Administration, on his return from World War II. The Somerset Soil Conservation District helped him along while he was studying with GI and vo-ag groups, catching up on new methods of making the best use of his land. It has also spurred him to increase his cropland to 40 acres on which he grows grain, soybeans, corn and tomatoes, and maintains



Cumulative benefits from skillful blending of good land use and soil and water conservation practices into a farm-wide program, applied and maintained through 15 years of earnest effort, are found on Stanley Sutton & Son's 134-acre Bittersweet dairy farm near Chestertown, Kent County. Rundown, washed-out, fertility-depleted fields have been transformed into a teeming enterprise that annually attracts many visitors who want to find out just how it was done.

improved hay land and pasture for his beef herd.

Sychronizing the operation of 1,800 acres, operated in about a dozen farms, into one smooth operation, was successfully accomplished by Mervin Selby. Selby is a former lumberman who is now a grain and livestock farmer near Girdletree. On 400 acres of cropland he gets maximum efficiency, using modern labor-saving equipment and handling the work with two full-time and two seasonal workers. He took advantage of the facilities of the Worcester Soil Conservation District.

On gummy old "clay-pipe" soil that had grown up to trees and brush and become littered with other obstructions, and where a century-old drainage ditch had been neglected for 50 years, he spent $4,000 in drainage and clearing work. He's getting excellent yields of corn and soybean where he had never before harvested a crops. Benefits already add up to an increase of at least 20 percent in value of the farm, and will go much higher.

Soil and water conservation practices put T. Jethro Pinder back in business at a farm from which he had been chased by excess water. Of 155 acres which he acquired near Salem in 1946, only 75 acres were in cropland. When he bought the farm he could produce corn and beans, but couldn't harvest them; the land was too wet. Now his yields are up and he harvests everything.

"I'm getting at least a third more production per acre," Pinder says. "I have gained full use of 12 previously unproductive acres. All of my cropland, and the county roads, have benefited from the drainage work. Now that I know how to handle wet land, I have bought and renewed work on a farm from which our family was driven by excess water a long time ago."

The return to productivity of his 110-acre farm at Willards encouraged Thomas W. Davis, who heads T. W. Davis Company operations at Salisbury, to attempt a similar job on another farm. At both farms all operations and improvements are based on 10-year plans.

On 40 acres water stood 4 or 5 inches deep after a storm, and it remained a long while. Digging 2 miles of main ditch cost Davis $2,600. But today, where nothing but blueberries could be produced, he is harvesting good yields of corn and soybeans, producing excellent pasture and supporting beef, hogs, turkeys and 12,000 broilers.

On his 243-acre place, Davis got paying yields of corn, soybeans and watermelons in 1953, the year the 86-acre clearing and 100-acre drainage jobs were done. Corn production there ranked second in the 1953 Wicomico 100 Bushel Club competition, with a yield of 87 shelled bushels per acre. The county average is about 30 bushels.

At Town Point when you come upon what might well be called "Bread Crumbs Farm," there is evidence of the help that livestock farmers get. The suggested name is logical because bread crumbs are a highly important ingredient in the animals' diet. The 145-acre farm is owned by George Huber, for whom Arthur Johnston has been farming for a quarter century. When Johnston first arrived there, he likes to recall, "you could hide a house in one of the many gullies." In his land use and treatment program with the Cecil Soil Conservation District, many of the marks of erosion have disappeared; others, healed over, remain as reminders of past follies. The good results come from stripcropping, and from more than a mile of diversion ditches and outlets developed in 3 years.

In earlier years Johnston produced corn, wheat and soybeans, and operated a dairy. Now he grows only grass and soybeans, and sorghum for silage. None of the livestock gets corn. In its place the beef herd and pigs receive a ration of bread crumbs twice a day, generously mixed with other feed. "Bread crumbs for livestock will work well for any farmer," Johnston comments, with a chuckle, "if he has a bakery." Johnston gets his unlimited supply from the Huber Baking Company at Wilmington, Del. Huber owns the bakery, as well as the farm.

J. Walter Candy, who has farmed the 213-acre C. L. Roe place, near Church Hill, for nearly a dozen years, is the Queen Anne farmer who probably has the widest range of conservation practices on his land. He has been working in the program since 1953 and has a few more practices yet to start.

Candy has established 32 acres of farm drainage and nearly a half mile of diversions. He has licked erosion and lifted fertility by putting 30 acres into contour strips and furrows, and 152 acres into crop rotations. Fifty-seven acres of pasture have been improved, 16 have been reseeded, and about 2 acres of wasteland have been cleared and put into production. Pigs, corn and milk roll to market as cash crops. In 1953 this farmer's beans averaged 30 bushels per acre on land that had previously been almost worthless. He planted winter oats in the spring and got an average yield of 40 bushels per acre. "Work done with the Queen Anne Soil Conservation District is the heart of all this progress," Candy declares.

Alton Spear, Vienna banker, shows how conservation farming through district cooperation has put a badly rundown farm back on its productive feet, after long efforts with obsolete methods had failed. In the early thirties, Maple Grove farm, near Vienna, was slipping down the skids; everything was being taken out of the soil, nothing was being put back. After 5 years of crop failures, a bank took over the property; during the next 5 years it, too, made a bad farming record, because it followed the same old practices. Then Spear bought this farm of 448 acres and put his sons, Robert and Gene, in charge. Backing them up, as cooperators, was the Dorchester Soil Conservation District.

Improvement started with a 2-mile ditch through the middle of the place. Laterals have been added as income has permitted and, at a cost of about $3,500, the drainage system is now 90 percent completed. "It's a good investment from a farmer's or a banker's viewpoint," Spear declares. Production on 100 acres of cropland is up to 100 percent. Tax assessments have been boosted twice. Income to meet all operating and improvement needs, and yield an investment dividend, is derived from such annual production as 140 acres of corn, 120 acres in wheat, 50 acres of snap beans and 20 acres of lespedeza. In 1953 Spear marketed 1,800 barrels of corn and 112 tons of beans.

In the mid-August '53 hurricane Charley Powell, Newark farmer, saw some spectacular

Drainage, clearing and sound farming methods have put acreages like these back into top production for Wicomico's T. W. Davis. The wooded section at the lower right, once cleared and highly productive land, is going back to cropland via the drainage-clearing route.

At the Maddox farm, Westover, the 107 acres seen here have been lifted from little or no cropping use into top-flight production by draining, clearing, and good conservation farming, in cooperation with the Somerset Soil Conservation District.

Chris Nagel paid $1,000 for this 85-acre farm near Federalsburg, Caroline County, when sale was forced because the land was unproductive. Today he puts the farm's value at $10,000.

things happen. In 70 years, old timers declared, "We never saw so much water fall in so short a time." Water was knee-deep in fields where Powell was growing soybeans. The drainage work done a year earlier proved its worth the next day when all excess water had disappeared from Powell's fields. Instead of losing his crop, Powell harvested a top yield of 25 bushels per acre. The whole drainage system had cost him $750, and in the deal he had gained 9 acres of cropland.

Ellis Ayres is one of three brothers who are doing topnotch conservation farming on 600 acres in 3 farms in the Farmington area. They cooperate with the Cecil Soil Conservation District. Ellis operates a dairy farm, with hogs and turkeys as sidelines. At a total expense of $250 in hard cash he has overcome his problems of excess water and erosion, obtained 54 more acres of pasture for his cows, and made a deep cut in the cost of his bought feeds. Since he switched to contouring, corn production on 40 acres has soared from about 70 bushels per acre to more than 100 bushels per acre. His total production is up at least one-third. "I'd use the conservation system even if I had only a 6-acre place," he says. "It is something that no farmer can afford to pass up."

Walter B. Harris, Sr., widely known Still Pond farmer, puts the same conclusion in other words when he says: "Conservation farming is best for the land, best for the farmer, and best for all those who eat or otherwise use what the farmer produces."

REPORT ON TREE FARMS. — The American Tree Farm System through which private woodlot owners are growing trees as a commercial crop has passed the 31,000,000-acre mark, according to American Forest Products Industries. This is an increase of 2,608,292 acres during the past 12 months.

Biggest gains were registered in the South. Florida's Tree Farm acreage jumped from 1,447,000 acres a year ago to 2,451,000 acres. Texas maintained its national lead with 3,366,000 acres. Georgia's acreage was 1,031,000 and Mississippi's totaled 1,178,000 acres. Louisiana gained over 100,000 acres for a new total of 1,578,000.

Started 13 years ago in Washington, the American Tree Farm System is now operating in 36 states. The acreage certified thus far is only a portion of timberland under good management, AFPI says. More forestlands will be brought into the program as rapidly as possible.

"FINER FARMS"

(Continued from page 110)

cropping to impede runoff. Alternating grain strips and row crops, following the contour, empty into "meadow waterways" which channel it off slowly enough to hold back the topsoil.

"All soil conservation practices I have seen have paid dividends," said Price, whose $3,100 investment in conservation netted $2,000 the first year. "It has gotten me out of the red in my method of farming."

Similar opinions prevail among the hundreds of "Finer Carolina" contestants.

T. F. Foster of Blanch, Route 1—a first-year winner—says his conservation practices raised corn yields from 20 bushels to 75-80 bushels per acre and tobacco from 1,200 to 1,400 pounds per acre on eroded Caswell County soil. Foster says he instituted a conservation plan when he first bought his farm in 1939 and has heeded SCS, FHA, PMA and extension specialists' advice ever since.

One farmer-philosopher, Joe Tippett of Zebulon, Route 3, commented: "I know I can take care of myself. But I wonder how the children and their children, and future generations will fare. Farsighted farmers should put back into the land as much as they take out, or more."

THE BUFFALO HUNTERS. By Mari Sandoz. 372 pp. Illustrated. 1954. New York: Hastings House, $4.50.

"The Buffalo Hunters" is a new book that belongs in the reference library of biologists, conservationists and Americana collectors. It is the latest by Mari Sandoz, author of "Old Jules" and "Crazy Horse." This one belongs in a class with these two but will appeal to a much wider range of readers.

This book contains far more than the story of the reckless slaughter of millions of American bison. It is a history of the vigorous military and pioneering epoch of the Great Plains that preceded the settlement of the West.

The aboriginal hunters who killed meat for a few hundred thousand sedentary American Indians made little dent on the buffalo numbers in central United States. Even later, when the Indians adapted the horse for use in hunting, their annual food requirements were far less than the natural buffalo increment. They lived in a land of plenty. This dramatic story gives the gory details of how white hunters reduced the immense buffalo herds to less than 700 between 1867 and 1883. In 1881 a winter buffalo hide brought $3.50 in St. Paul and Chicago. A robe brought $7.50. The hide and robe business was good for new railroads but the heartless killing caused the Indians to fight until finally they were conquered and confined to reservations.

The stories of many colorful characters are part of the history of the great buffalo slaughter. Miss Sandoz takes the gloss and popular wrappings from many of these illustrious figures. Buffalo Bill Cody she calls "Broadway's Scout of the Plains." The real hide and meat men were Billy Dixon of "Adobe Walls" fame, Lonesome Charley Reynolds and Wild Bill Hickok. Claims are made that Lonesome Charley got more meat per hundred cartridges than any other hide man. Wild Bill was a bigger draw as a hide man than he was as a frontier marshal, despite the fact that his popular reputation was built around gun shooting the Hard Cases of Dodge City, Abilene and Deadwood. General George Custer is portrayed in his lesser known roles as squawman and Indian raider.

A few humanitarians cried out against the wasteful plunder but the viewpoints of men like General Phil Sheridan, who said when the buffalos were killed the Indian uprisings would end, prevailed. This was true, of course, but that didn't absolve the hide hunters from blame for the wanton slaughter of American bison.

Brawling and Indian fighting were part of the buffalo hunting era and the author gives much interesting detail on this feature. One of the most dramatic chapters deals with the Indian attack on Adobe Walls in the Texas Panhandle.

If you want to dig deeper into the fascinating history of buffalos and buffalo hunting, Miss Sandoz has provided several pages of bibliography on the subject at the back of her book.

—B. W. ALLRED

Public Library
Detroit, Mich.